8th Grade Curriculum Overview

Ratio and proportional relationships

- **Expand knowledge of ratio and rate**
- **Compute simple interest**
- **Solve problems using percents**
- **Understand that the slope of a line is the ratio of the rise to the run**

The number system

- **Perform the math operations using fractions**
- **Find common factors and multiples**
- **Evaluate absolute values**
- **Graph equations on the *xy*-coordinate system**
- **Write numbers in scientific notation**
- **Write numbers in decimal notation**
- **Change a rational number to a decimal or percent**
- **Graph a number sentence on a number line**
- **Find the prime factorization of a number**
- **Recognize that the irrational number π can be approximated using a rational number**
- **Understand metric measure and choose the appropriate unit**
- **Understand standard measure and choose the appropriate unit**
- **Perform multiplication and division on variables to powers**
- **Evaluate a square root**
- **Simplify an expression using the order of operations**

Expressions and equations

- **Solve equations in one variable**
- **Create and solve proportions**
- **Use the commutative, associative, and distributive properties to simplify expressions and/or solve equations**
- **Simplify polynomial expressions**
- **Compare numbers using <, >, and =**
- **Find the slope of a line.**
- **Recognize slope as a constant rate of change and apply it to a real world setting**
- **Graph equations in the form $y = mx + b$ and understand that *m* is the slope and *b* is the *y*-intercept**
- **Extend a pattern of discrete numbers and find a rule for the "next" term**
- **Order numbers from smallest to largest or vice versa**
- **Write a sentence or expression using algebraic notation**
- **Substitute a number into a variable expression and evaluate it**
- **Recognize that the solution to a system of two equations is the point or points where they intersect**

Functions

- **Model a relationship using a function**
- **Evaluate an expression written in function notation**

Geometry

- **Solve problems using the formulas for triangles, circles, and the regular quadrilaterals**
- **Find the circumference, perimeter or area of regular plane geometric figures**
- **Find the surface area and the volume of three-dimensional figures**
- **Solve problems using angle measures**
- **Understand congruence by creating congruence statements**
- **Understand congruence by accurately drawing congruent figures**
- **Analyze size changes on similar figures**

Statistics and probability

- **Find the mean and median of a data set**
- **Find theoretical probabilities**
- **Use the measures of central tendency to explain a data set**
- **Calculate a probability**
- **Demonstrate an understanding of a stem and leaf plot**
- **Demonstrate an understanding of a box and whisker plot**

8th Grade

IMPORTANT!
Instructions for Parents

- To use Summer Math Skills Sharpener, simply tear off a page and have your child complete it. The book is designed to be used *3-4 days per week for 10 weeks.*
- Check answers immediately for optimal feedback. An answer sheet and solution pages are provided at the back of the book. (**Solution pages represent only ONE method of solving each problem.**)
- "Help Pages" have been added at the front of the book to clarify certain concepts.
- Allow your child to use a calculator.
- When solving division problems with remainders, students should use fractions or decimals rounded off to the nearest hundredth.
- When solving fraction problems, students should rename answers to the lowest possible terms.
- Pages entitled "Brain Aerobics" are located at the back of the book. Have your child complete one page per week for extra practice. The answers to these questions are on the back of each page.
- A "Glossary of Terms" and a "Table of Measurements" are at the back of the book.
- Adjust the program to vacations, etc. Presentation of mixed concepts on every page ensures that all skills are reinforced.
- If your child experiences difficulty with concepts that have been already taught, address the problem with his or her teacher in the fall; more consistent problems indicate that a tutor may be needed. Additionally, there may be concepts that are not covered in some school curricula.

Dividing a Whole Number by a Fraction

Example: $2 \div \frac{1}{3}$

1st Step: $2 = \frac{2}{1}$ — Put the *whole number* in fraction form.

2nd Step: $\frac{2}{1} \div \frac{1}{3}$ ← divisor — Locate the divisor and invert.

$\frac{1}{3}$ becomes $\frac{3}{1}$

3rd Step: $\frac{2}{1} \times \frac{3}{1} = \frac{6}{1}$ — Invert the divisor and multiply.

4th Step: $\frac{6}{1} = 6$

Dividing a Fraction by a Whole Number

Example: $\frac{1}{3} \div 2$

1st Step: $2 = \frac{2}{1}$ — Put the whole number in fraction form.

2nd Step: $\frac{1}{3} \div \frac{2}{1}$ ← divisor — Locate the divisor and invert.

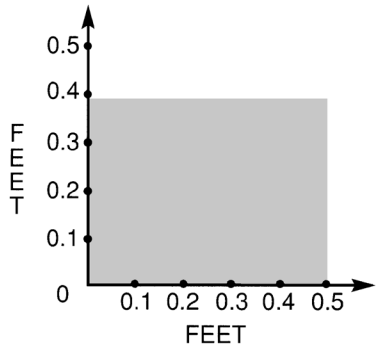
$\frac{2}{1}$ becomes $\frac{1}{2}$

3rd Step: $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ — Multiply the numerators and denominators.

4th Step: $\frac{1}{6}$ is in lowest terms — Simplify (reduce) if necessary.

1. The circumference, *c*, of a circle with radius, *r*, is $c = 2\pi r$. (Let $\pi = 3.14$).
Find the circumference of a circle with $r = 8$. Let π = 3.14 or use your π key if your calculator has one.

2. Find the area of this shaded rectangle:



3. The *mean* of a data set is the average of the values. The *median* is the number in the middle when the values are ordered from smallest to largest.
Use this data set: 20 12 10 19 14
a. Find the mean. _____
b. Find the median. _____

4. Hershel had 100 baseball cards that he labeled from 1-100. He started with number one and marked every 5th card with an *X*, every 7th card with an *O* and every 10th card with a √. What number card will be the first to have all 3 marks (*XO*√)?

5. How many games are played in a 4 team round robin tournament? (Each team plays every other team only once.)

6. For problems a through c, simplify. (Review order of operations from the Help Pages).

a. $4 - 3 \times 2 =$ **b.** $2^2 \times (4 - 2) =$ **c.** $\dfrac{8-3}{4-1} =$

7. Rename each of the following as a decimal.

a. $\frac{1}{4}$ = _____ **b.** $\frac{3}{5}$ = _____ **c.** $\frac{27}{100}$ = _____

d. $\frac{3}{2}$ = _____ **e.** $\frac{7}{1000}$ = _____ **f.** $\frac{1}{3}$ = _____

8. a. $3\frac{1}{4} \div \frac{1}{4}$ = _____ **b.** $7\frac{1}{5} \times \frac{1}{2}$ = _____

9. a. $\frac{1}{1{,}000} \times \frac{1}{1{,}000}$ = _____ **b.** $\frac{1}{100} \times \frac{1}{100}$ = _____

10. Any number plus its opposite is zero. (Review solving algebraic sentences, example 1 from the Help Pages). Solve these equations for *x*.

a. $x + 9 = -21$ **b.** $x + 1.5 = 3.75$ **c.** $x - \frac{1}{2} = \frac{9}{4}$

11. Lana has a friend who is deaf and uses sign language to communicate. She can sign about 36 concepts per minute. How many concepts can she sign in a 15 minute period?

12. A *ratio* is the quotient of two quantities in the same unit. In a certain class of 30, 14 play after school sports. Write the ratio of those playing an after school sport to those who do not.

Lesson #21

1. Simplify.

a. $\left(x^2\right)^2\left(x^3\right) =$ **b.** $\left(x^3\right)^4\left(x^{-4}\right) =$ **c.** $4^3 \bullet \frac{1}{4^2} =$

2. The sum of three consecutive even integers is 78. Let *x* = smallest.

a. Write the expressions for the next two consecutive even integers in terms of *x*.

b. Write an equation to represent this situation.

c. Find the three integers.

3. If the first two angles of a triangle measure 37° and 104 °, what is the measurement of the third?

_____

4. Jacob needs a storage bin that is at most 3000 cubic feet. He found one with dimensions 17 $ft \times 15\ ft \times 10\ ft$.

a. Write an inequality to represent this situation.

b. Does this storage bin meet his requirement?

5. a. $4\frac{1}{2} \div 3\frac{1}{2} =$ _____ **b.** $3\frac{1}{3} \times 4\frac{2}{7} =$ _____

6. Find the height of a cone if its volume is 108π inches cubed and the radius is 6 inches.

7. **Mental math: Find each product.**

   a. $2000 \times 400 =$ b. $50 \times 100000 =$

   c. $3000 \times .04 =$ d. $10000 \times .0001 =$

8. **Estimate by rounding to the nearest whole number.**

   a. $8.07 \times 2.9 \approx$ b. $24.7 \times 3.01 \approx$

9. **Problem solving: Janine is 7 years younger than Lucy and 4 years older than Samantha. The average of their ages is 16. How old is:**

   a. Janine? _____ b. Samantha? _____ c. Lucy? _____

10. a. $\frac{3}{2} + \frac{5}{3} =$ _____ b. $(-14) - (-3) =$ _____

11. **Calculator skill:** $240^2 + 10.9^2 - .9^2 =$ _____

    Turn your answer upside down to find out what you pay at the end of the month.

    _____

12. **Susan drove 4 hours. Her average speed was 60 mph. Finish the chart below to give her an average speed of 60 mph.**

Hour	Speed
1st	65
2nd	70
3rd	
4th	55

Lesson #31

1. For problems, a – f, simplify. (Recall that the order of operations is: parentheses, powers, multiplication and division from left to right; addition and subtraction from left to right.)

a. $8 / 2 \times 3$ b. $4(6-2)^2$ c. $4+2(3+2)^2$

d. $\dfrac{1-1^5}{1^3}$ e. $9\left(\dfrac{2}{3}\right)^2$ f. $4-4\times 2-2$

2. A *variable* is a symbol that can be replaced by a number.

Let $a = 3$ $b = -3$ $c = \dfrac{1}{3}$ $d = -\dfrac{1}{3}$

a. $a + b$ b. $a - b$ c. ab

d. $b \div d$ e. b^2 f. c^{-1}

3. An *arithmetic sequence* is a number pattern where the difference between consecutive numbers (terms) is constant.

The first three terms of a sequence are –5, 1, 7, . . .

a. **Find the next two terms in this sequence. _____, _____**

b. **Find the difference (next term – previous term) between any two consecutive terms. _____**

(This is the constant difference or the constant rate of change.)

c. **If n is the number of the term in the sequence, find a rule or formula for any term in the sequence. (Hint: Find the zero term.)**

d. **Use your rule to find the tenth term in the sequence. _____**

4. For problems a – c, solve for x.

a. $2x - 3 = 7$ b. $\dfrac{2}{3}x = 8$ c. $2x - \dfrac{3}{4} = \dfrac{7}{8}$

5. Use the *distributive property* to find the missing number or variable.

a. $7(x + y) = 7(\ \ ) + 7(\ \ )$ b. $4x + 8y = (\ \ )(x + 2y)$

BRAIN AEROBICS - WEEK 1

1. Maddy's mom decorated the clubhouse at their apartment complex for Maddy's birthday. She hung 2 strips of pink crepe paper and 3 strips of purple crepe paper all the way around the clubhouse room. The room measures 45 feet long and 30 feet wide. How many yards of crepe paper did Maddy's mom have to buy? If crepe paper costs $3.00 for 25 yards, how much did she spend on crepe paper?

2. The veterinarian told Denise that her dog needed to lose some weight. She put him on a diet. Max lost 4% of his total weight in the first week. If Max weighed 48 pounds at the end of the first week, how much did he weigh before his diet?

3. Burns Park School lets basketball teams rent the gym on weekends for a fee of $25.00 for $1\frac{1}{2}$ hour sessions. Last year the school earned $11,400. For how many sessions was the gym rented?

4. One half of the students at Pioneer High School bring their lunches to school. One fourth of the students go home for lunch, and the remaining 500 buy their lunches. How many students attend Pioneer High?

5. It took Janine 20 minutes to knit $\frac{1}{8}$ of her scarf. How long will it take her to complete the entire scarf?

The Metric Units

Temperature - Celsius
0°C: the freezing point of water
37°C: the normal body temperature
100°C: the boiling point of water

Mass
1000 milligrams (mg) = 1 gram
1000 grams = 1 kilogram (kg)
1000 kilograms = 1 metric ton (t)

Capacity
1000 milliliters (mL) = 1 liter (L)
1000 liters = 1 kiloliter (kL)

Length
10 millimeters (mm) = 1 centimeter
10 centimeters (cm) = 1 decimeter
1000 millimeters (mm) = 1 meter (m)
100 centimeters = 1 meter (m)
10 decimeters (dm) = 1 meter
1000 meters (m) = 1 kilometer (km)

The Customary Units

Temperature - Fahrenheit
32°F: the freezing point of water
98.6°F: the normal body temperature
212°F: the boiling point of water

Weight
1 pound (lb) = 16 ounces (oz)
1 ton = 2,000 pounds

Time
1 minute (min) = 60 seconds (s)
1 hour = 60 minutes
1 day = 24 hours
1 week = 7 days
1 month (mo) = approx. 4 weeks
1 year (yr) = 365 days
52 weeks
12 months
1 decade = 10 years
1 century = 100 years

Capacity

1 cup (c) =	8 fluid ounces (fl oz)
1 pint (pt) =	16 fluid ounces 2 cups
1 quart (qt) =	32 fluid ounces 4 cups 2 pints
1 gallon (gal)=	128 fluid ounces 16 cups 8 pints 4 quarts

Length

1 foot (ft) =	12 inches (in)
1 yard (yd) =	36 inches 3 feet
1 mile (mi) =	5,280 feet 1,760 yards

GLOSSARY OF TERMS AND FORMULAS 1

a.m. – The time before noon and after midnight.

Absolute value – The distance a number is from zero on a number line. Distance is always positive. Ex. |2| = 2 and |-2| = 2

Acute angle – an angle measuring greater than 0 degrees and less than 90 degrees.

Addends – a number that is added to another.

Algebraic equation – a math sentence relating two expressions as equal.

Algebraic expression – a combination of numbers and variables joined by the operations of arithmetic. Examples of operations are +, -, ×, ÷

Angle – the union of two rays (the sides) at a point (the vertex).

Area – the number of unit squares or parts of unit squares required to tile a two dimensional figure.

Ex. parallelogram: $A = hb$ trapezoid: $A = \frac{1}{2}h(b_1 + b_2)$

rectangle: $A = lw$ triangle: $A = \frac{1}{2}bh$

circle: $A = \pi r^2$ square: $A = s^2$

Arithmetic sequence – a number pattern where the difference between consecutive terms is constant.

Average – a calculated central value found by adding all the numbers and dividing by how many numbers there are. It is also known as the mean value.

Biased sample – a sample where the members of the sample are either underrepresented or totally ignored.

Center – the middle. The point from which all points on a circle are equally distant.

1a). $(x^2)^2 (x^3)$ $x^4 \cdot x^3 = x^7$ b). $(x^3)^4 (x^{-4})$ $x^{12} \cdot (x^{-4}) = x^8$ c). $4^3 \cdot \frac{1}{4^2} = 4$

2 a). $x+2, x+4$ b). $x+x+2+x+4=78$

c. $3x+6=78$

$\frac{1}{3} \cdot 3x = 72 \cdot \frac{1}{3}$

$x = 24$ $x+2=26$ $x+4=28$

3) $180 - 37 - 104 = 39°$

4 a). $17 \times 15 \times 10 \leq 3000$

b). $2550 \leq 3000$ yes

5 a). $4\frac{1}{2} \div 3\frac{1}{2} =$

$\frac{9}{2} \div \frac{7}{2} =$

$\frac{9}{2} \times \frac{2}{7} = \frac{9}{7} = 1\frac{2}{7}$

b). $3\frac{1}{3} \times 4\frac{2}{7} =$

$\frac{10}{3} \times \frac{30}{7} = \frac{100}{7} = 14\frac{2}{7}$

6) $V = \frac{1}{3} B h$

$\frac{1}{12\pi} \cdot 108\pi = \frac{1}{3} \cdot 36\pi h \cdot \frac{1}{12\pi}$

$h = 9$in

7 a). 800,000 b). 5,000,000

c). 120 d). 1

8 a). ≈ 24 b). ≈ 75

9 Let x = Janine

$x+7$ = Lucy

$x-4$ = Samantha

$16 \cdot 3 = 48$

$x+x+7+x-4=48$

$3x+3=48$

$-3 \quad -3$

$\frac{1}{3} \cdot 3x = 45 \cdot \frac{1}{3}$

$x = 15$ $x+7=22$ $x-4=11$

10 a). $\frac{3}{5} + \frac{5}{3} =$

$\frac{9}{6} + \frac{10}{6} = \frac{19}{6} = 3\frac{1}{6}$

b) -11

11) 57718 BILLS

12) $4.65 + 70 + x + 55 = 60 \cdot 4$

$190 + x = 240$

$-190 \quad -190$

$x = 50$

1) b. centimeters. 2 a). -2 b). -2 c). $y = -2x - 2$

2) A \$95.00 B $115 \times .8 =$ \$92.00 C $105 \times .9 =$ \$94.00

4) $x + 2x = 180$

$\frac{1}{3} \cdot 3x = 180 \cdot \frac{1}{3}$

$x = 60°$ $2x = 120°$

a). 60° b). 120°

c). 60° d). 180°

5 a). 7283.276 6 a). $2^x = 64$

$2^6 = 64$

$x = 6$

b). 10

b). $\sqrt{x} = 6$

$x = 36$

c). $|x| = 4$

$x = \pm 4$

7) $.85 \times 68 = 57.80$

-20

\$37.80 ✓

or $68 - 20 = 48$

$.85 \times 48 =$ \$40.80

The % discount should precede gift card.

8 a). 400 b). 1,000,000 c). 20

9) Notice term 2 is 8 and term 6 is 28

$\frac{28-8}{6-2} = \frac{20}{4} = 5$

3 8 13 18 23 28

10) 10,000

11 a). 88.6 b). 95

c). Answers will vary. A-

The 65 was his first and only low grade, and his grades kept improving.

12 a). .70 b). .02

1 a). $t = \frac{d}{r}$ $t = \frac{239}{60} \approx$ 4 hours b). $\frac{239}{40} \approx$ 6 gal.

2) $x + x - 15 = 90$

$2x - 15 = 90$

$+15 \quad +15$

$\frac{1}{2} \cdot 2x = 105 \cdot \frac{1}{2}$

$x = 52.5°$

$x - 15 = 37.5°$

3 a) $\sqrt{5} \approx 2.1$

b) $\sqrt{15} \approx 2.24$

c) Irrational

4) $\frac{1}{3}$ 30% $\frac{33}{100}$ .333

.3333 .3000 .3300 .3330

30% $\frac{33}{100}$ .333 $\frac{1}{3}$

5) $12\frac{1}{4} \div 1\frac{1}{4}$

$\frac{49}{4} \div \frac{5}{4}$

$\frac{49}{4} \times \frac{4}{5} = \frac{49}{5} = 9\frac{4}{5}$ 9 full servings

6) $\frac{12}{48} = \frac{15}{60} = \frac{18}{72} = \frac{24}{96} = \frac{21}{84}$

7) $\frac{1}{8} = .125 =$ 12.5%

8) Row 1 = 11

Row 2 = 6

Row 3 = 8

Row 4 = 8

Row 5 = 10

Row 6 = 9

Row 7 = 16

68 dogs

9 a). .5% < .05 b). .09 < 11%

c). $\frac{14}{13} > \frac{15}{14}$ d). $.3 < \frac{1}{3}$

10 a). 300 b). $\frac{2}{7}$

11) $\frac{\$3.50}{36} \approx .097$ $\frac{\$4.90}{48} \approx .102$

36 oz for \$3.50

12 a). 4 b). 9

1) $14\frac{1}{2}$ km = 14500 m = 1,450,000 mm

2 a). $3\frac{4}{6} \times 7\frac{1}{3} =$

$\frac{19}{5} \times \frac{22}{3} = \frac{418}{15} = 27\frac{13}{15}$

b). $3\frac{3}{10} \times \frac{1}{4} =$

$\frac{33}{10} \times \frac{1}{4} = \frac{33}{40}$

3 a). $\frac{1}{20} = .05 = 5\%$ b). $\frac{4}{5} = .80 = 80\%$

4) $2 \times 1000 = 2000$

$2 \times 100 = 200$

$2 \times 10 = 20$

$2 \times 1 = 2$

$2 \times .1 = .2$

$2 \times .01 = .02$

$2 \times .001 = .002$

5 a). $90 - 77° = 13°$

b). 14°

6 a). 10^4 b). $2x^2$ c). $\frac{5a^4}{b^4}$

7 a). 500 b) 500

8 a). 4 b). 5th c). 3 d). 0

9 a). 15, 19 b). 35

10) $I = 200(.02) =$ \$4

11) 7hr 11min = 6hr 71min

$-$ 5hr 34min

1hr 37min